PRIMARY USER EMULATION ATTACK MITIGATION IN COGNITIVE RADIO

SHORT SYNOPSIS

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by

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ABSTRACT

It is very much sure to clear up the spectrum scarcity problem by means of permitting secondary users to coexist with primary customers without causing interference to their verbal exchange, cognitive radio is a very essential & popular technique. Although there are different operational factors of CR are being explored vigorously, its safety aspects have received little more attention. In survey, a brief evaluate of the CR era is supplied accompanied by an in depth analysis of the safety attacks targeting "Cognitive Radio Networks" (CRNs) alongside their related mitigation strategies.

In spite of the fact that a considerable amount of exploration endeavors has been centered around the identification and barrier system of PUEA in cognitive radio systems, less consideration have been given to battling and alleviating PUEA in a helpful range detecting condition. I would be adding to explore in the field of cognitive radio systems through an experimenting concerning the effects of Primary User Emulation Attacks (PUEA) on cognitive radio, issue of conviction among clients in the systems and furthermore alleviating the exercises of PUEA in the system.

Key words: Cognitive Radio, Primary User Emulation Attacks (PUEA), CRN, Primary User (PU), Mitigation, secondary user, unlicensed user

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1. Introduction

Cognitive Radio is a sort of remote correspondence method in which a device known as transmitter receiver combined senses communication network to control which channels are unused and which is under used. After receives the network information, it moves to unused network by avoiding used network. Simply, a combination of transmitter and receiver tendsto use the best available wireless communication network for communication purpose.

The main ideas to implementation of the cognitive radio are:

- Device can use to determine its geographic location.
- It can distinguish licensed and unlicensed user.
- It will send the data in encrypted manner and can do decryption also.
- Use to detect close wireless devices.
- Output can be adjusted in CR.

Distant correspondence has without a doubt been one of snappiest making part of the exchanges business starting late due to the way that far off applications has reliably been on the extension. Thus, distant applications and structures working in unlicensed range bunches have dynamically provoked the blockage of the absurd gatherings making them insufficient and difficult to reach. In any case, to examination related to the range shortage problems by various administrative channels near and far, including the US “Federal Communication Commission” and the “Independent Regulator and Competition Authority” in the UK, have detailed that in spite of the fact that the interest for range will essentially increment sooner rather than later the serious issue isn't the range shortage however the wastefulness in range utilization. Hence to address the inefficient range use and range deficiency issues, another technique for extend the board is required. This procedure ought to be good for giving distant admittance to unlicensed customers, in any case called assistant customers, by allowing them to innovatively get to deserted approved range while at the same time guarantying the benefits of officeholder customers, in any case called fundamental customers who has a "bestin class" access or legacy rights over the range. This recommends an approved range bandcan be gotten to by a helper customer specifically if not being utilized by a basic customer. This new strategy is suggested as "Dynamic Spectrum Access" (DSA).

The Cognitive radio development expects a critical activity in ensuring the affirmation of this DSA perspective. The possibility of Cognitive radio was first proposed in 1999 by Joseph Mitola where intellectual radio was depicted as "Programming Defined Radio" (SDR) which

has a logically versatile approach to manage far off correspondence. An intellectual radio can gain from its condition and keenly modify its boundaries dependent on what has been realized. So in DSA, a psychological radio can find out about the range use status of a band and naturally chooses if the band is involved by the essential client or not.

The process of learning about the spectrum usage status of a band is called spectrum sensing and this spectrum sensing technique plays a pivotal role to ensure a successful DSA. During a spectrum sensing process, if essential users begin to send signal across a specific spectrum band occupied by an unlicensed user, the unlicensed user is ideally required to free the network frequency band immediately and automatically search for a vacant band. But when there is no active licensed user seen in the spectrum, all unlicensed users can enjoy equal rights to access the frequency band which are unoccupied.

For unlicensed client to used full rights as the authorized client, the unlicensed client imitates the qualities of an authorized client making the auxiliary client carry on cruelly. The consequence of this is other unlicensed clients will recognize the 'vindictive' optional client as an authorized client and clear the pre-owned recurrence for the cruel auxiliary client trusting it is an authorized client. Along these lines, the vindictive client gets unmatched admittance to the essential client's ghostly band. This sort of assault is considered as an 'Essential User Emulation Attack' (PUEA) [7].

2. Literature Review

Discussed about the recent treads in which all the organization wants connectivity by Bablu Kumar ,Jitendra Jangir, Purneshwari Varshney and ,Pradeep Kumar Sharma 2014, usage of unapproved recurrence range as a channels for easy to use availability in far off stations and novel thoughts by filling in as a hindrance free and savvy stage for testing and actualizing of new innovations. In Cognitive Radio Communications and Networks detecting/recognition with various kinds of assaults from pernicious clients is a significant errand to fabricate productive and secure unique range access framework so these assaults can't close down a specialist on call or comparable crisis strategic organizations during basic periods. Protection from these classes of assaults through cryptographic alone isn't adequate. Cognitive radio has features to handle situation more precisely by utilizing the ability to sense the actual propagation conditions that occur, and to adjust the radio dynamically to best fit these conditions. Goutam Ghosh, Prasun Das and Subhajit Chatterjee 2014 ,discussed the

methodology is to take the choices based on power spectral density of the channel which can be utilized intellectually to look through the accessible unearthly holes those can be utilized to new approaching clients (Secondary Users) consequently improving the general channel's throughput. In work main parameter performed is the energy discovery range detecting utilizing FFT inside the predefined recurrence band. It is indicated that how the intellectual radio functions powerfully with changing the recurrence band starting with one then onto the next and effectively illustrated with simulation result using MATLAB. The Additive White Gaussian Noise (AWGN) with the Signal to Noise proportion (SNR) values are taken as 5dB, 15dB and Attenuation rates are 10 and 15 is utilized. That is the Spectrum Access in Cognitive Radio showed effectively without meddling with the other recurrence groups utilized by the essential client (PU). Md. Al-Amin, Md. Ibrahim Abdullah, Md. Jahangir Alam, Sheikh DobirHossain and NazmulHossain 2016, illustrate the fundamental issues is as yet open with respect to the distinguishing proof of assaults against the location of essential client movement. In security setting, circulated type approach psychological radio organizations may be compelling than concentrated methodologies, conversely muddling the plan of organization in client suitable systems. By distributing recurrence band and security choices to a few unapproved hubs, the danger of DoS assaults against a solitary purpose of disappointment (i.e., the focal substance) can be disposed of. In this specific circumstance, other component like bunching plans might be another option, with each group having its own focal element (i.e., choice and combination focus) and the auxiliary clients having the option to choose another focal element or move to another bunch in the event of disappointment or assault.

Tripama Mukherjee and Dr. Ashok Nath researched activities in CR and major Issue in the design of CR communication networks have been discussed (e.g., spectrum sensing, DSA, applications, and standardization), and the related work in the literature have been reviewed. MonishaRavi, Nisha Ravi, Dr. N. Ravi illustrate diagram of Primary User Emulation assault has been given, with its plan system. In regard to come out this assault, found in Cognitive Radio Networks, studies of some the best methods has been quickly indicated. Milan Patel, Kirtan Patel, Sagar Patel 2017, simulates the output signals, and that distinguish whether or not there are primary users or not, In this they have a tendency to get however the SNR influences the detections.Vinod H. Patil, Palash Doshi, Sudarshan, Dhomeja, Sonali Thakur 2017, spectrum sensing's concepts is used and various sensing techniques and challenges are discussed. Hardware is Universal Software Radio Peripheral (USRP). The gadget utilized

for reenacting the outcome is USRP-2901, which is a tunable RF transreceiver. For detecting of range, a calculation is made on LabView programming which gives the visual, graphical portrayal of the range that is being detected and furthermore the commotion present in that specific band of recurrence. Zakaria El Mrabet , Youness Arjoune , HassanEl Ghazi , Badr Abou Al Majd 2018, new methodology for identifying essential client imitating assaults with non-fixed essential client. A Kalman channel based procedure is utilized for detecting and getting the situation of the moving essential hubs, and afterward got power is utilized to infer the situation of the transmitter before contrasting it with that assessed. Hitesh Mohapatra 2018, cognitive radio is already being considered as the candidate for the 5th generation of wireless communications. The utilization of the cognitive radio system will be one of the most precise and effective scientific endeavors in the 21st century. This paper shows impact of the CR research challenges in order to determine the effectiveness and reliability of wireless networks for utilize cognitive radio network in proper manner. Existing methods in area of wide ranging wireless environment are not considered to be the most precise or accurate methods and so new idea in the research field is needed to this context that has generated a lot of research interest in the recent past.

3. Objectives and Motivation of the Study

Cognitive radio technique is quite popular and important as a practical possible solution to efficiently using the spectrum. Important process to implementation of cognitive radio network is frequency sensing for checking or determine the existence the activity of a primary or licensed user. But major problem associated to frequency sensing is problem of secondary users to accurately distinguish primary user signals from PUEA signals. Based on the principle that primary users signal possesses the preference to access a spectral band, while unlicensed users must free spectral band to access over to the primary user and ensure that no crosstalk is caused, there exist the potential for malicious unlicensed users to detect and use the spectral characteristics of the licensed users in order to utilize the spectral bands occupied by other unlicensed users.

In order to resolve the security problems arising from PUEA in cognitive radio (CR) networks, the main objective of this research is to develop an efficient technique and defense mechanism to mitigate the activities of PUEA in CR networks. This will help in reducing the

errors made by secondary users in the network and also assist unlicensed users in successfully detecting licensed user signals in spectral network while limiting interference between users in the system. The work will also aims at improving trustworthiness amongst secondary users in the network by proposing a technique to verify if the source of spectrum occupancy information is from a genuine primary user in order to identify and evict malicious users from the network and maximise spectrum utilization efficiency. This will also assist in building a healthy relationship amongst secondary users in the network.

4. Gaps in Research study

- Interference detection at auxiliary receiver – main objective of cognitive radio is to protect licensed system from error or interference.
- Expanding the detecting time permits an expansion of the number and the nature of the distinguished range openings.
- Speed and unwavering quality of location – complete intellectual pattern of cognitive radio is going on progressively, thusly it is fundamental to create dependable and quick techniques for range detection.
- Spread range location - essential clients utilizing spread range are hard to distinguish as the intensity of the essential client is dispersed over a wide spectrum, perhaps covered up in the clamor.

- **RSSI based PU localization:**
  - Scheme based on Received signal power.
  - Pr = Pt + a 10 log (do/d) + w
  - It can be defeated by attacker by using Antenna arrays with different power levels.
- **Working with helper nodes.**
  - This technique is very effective in terms of authenticating primary user. Utilize the closeness of Helper node with licensed user.
  - In this technique problem is the authentication of wireless link signature of the helper node. Also if attackers are placed near helper nodes, then it causes problems.

5. Research Methodology to be adopted

"Time of Emission Estimation Based Approach: Our solution to PUEA"

5.1 Proposed Approach

1. We have to calculate the time of emission for all the users or nodes present in the desired network.

2. Figure out the mean estimation of all the computed time of emission from the clients or hubs in the CRN.

3. After figure out the means of average of all the computed time of emissions, calcite the deviation esteem for every client or hub present in the range band.

4. Then, we have to compute the following parameters also:

(i) Decide μ (Maximum deviation in the estimation by a hub under a non-assault situation in the organization).

(ii). Calculate the value k

a) On the off chance that the determined worth comes is excessively little? We need to increment in false negative portion.

b) if the determined worth comes is excessively enormous? We need to increment false alarm portion.

c) We must have to set Tradeoff!

5. After calculating above values then, the following conditions must be under observation to find the desired scenario result

On the off chance that, $\delta i > \mu$

At that point, Increment esteem in C

Where,

μ - > Maximum permissible deviation esteem

C - > number of qualities strayed

6. Too,

In the event that, $C > k$

At that point, PUEA has been recognized

Where, k is the most extreme no. of strayed reports to be admissible.

Note: Note: We probably fixed a limit esteem which is utilized to endure certain number of designed hub settles. However, in the event that practically all clients and hubs in range band are undermined, at that point the organization isn't valuable

6. Expected outcome of the Research

An Attack Model against the approaches using RSSI is proposed and will be simulate with the help of MATLAB. It will be a Novel approach to mitigate PUEA using Time of Emission Estimation and this approach will be compare with a RSSI based approach.

7. Proposed Time Frame

TIME FRAME	July-Dec 2018	Jan-Jun-19	July-Dec.19	Jan-Jun-20	July-Dec.20	Jan-Jun.-21	July-Dec. 21	Jan-Jun. 22	July-Dec.22
Course work									
Extensive literature survey									
Problem statement formulation									
Publication On literature Survey									
Implement PUEA time estimation techniques by using MATLAB									
Develop PUEA time estimation technique									
Publication on PUEA time estimation technique									
Develop an algorithm for improving PUEA time estimation reduced computational complexity.									
Publication on obtained result									
Thesis submission									

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